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BLANK ROME LLP
600 NEW HAMPSHIRE AVENUE, N.W.
WASHINGTON, DC 20037

| EXAMINER | |
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| MILLER, ROSE MARY | |
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/553,471 | OSTANIN, VICTOR PETROVICH | |
| | Examiner | Art Unit | |
| | ROSE M. MILLER | 2856 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *17 October 2005 and 24 April 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-24* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-24* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *17 October 2005* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *10/17/05 & 4/24/07*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

### *Drawings*

1. The drawings are objected to because empty diagram boxes are impermissible under 37 CFR §1.83(a) which recites as follows:

> *"The drawing in a nonprovisional application must show every feature of the invention specified in the claims. However, conventional features disclosed in the description and claims, where their detailed illustration is not essential for a proper understanding of the invention, should be illustrated in the drawing in the form of a graphical drawing symbol or a* ***labeled*** *representation (e.g., a* ***labeled*** *rectangular box)." (Emphasis added by Examiner)*

The empty diagram boxes 2 and 3, found in Figure 1 of the drawings, must be labeled with an appropriate descriptive phrase/legend in addition to the reference number all ready present. Please see 37 CFR 1.84(n), 37 CFR 1.84(o), and 37 CFR 1.84(p) concerning the differences between a descriptive phrase/legend and a reference number. Appropriate correction is required.

Replacement drawing sheets including the correction are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

2. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the different analytes or binding partners being immobilised at different positions on the surface as found in claims 9 and 23 and the surface acoustic device of claim 12 must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an

application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

***Specification***

3. The abstract of the disclosure is objected to because legal phraseology such as the phrase "comprises" is not permitted in the abstract. Correction is required. See MPEP § 608.01(b).

***Claim Objections***

4. Claims 1 and 17 are objected to because of the following informalities: the use of the phrase "and/or", while not grammatically incorrect, can lead to confusion as to what is actually being claimed. A suggestion is to expand the phrase such that all possibilities are recited in an alternative format only. Appropriate correction is required.

***Claim Rejections - 35 USC § 112***

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claims 1-24 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 1-16 are rejected as being indefinite as the phrase "separating an analyte from a mixture or for detecting an analyte or for determining the affinity, or a property related to affinity, between binding partners", found in the preamble of claim 1, renders the claims indefinite as it makes the scope of the claim undeterminable due to the excessive number of operations which can be, or are being, performed by the claimed invention. Claims 2-16 are rejected as they fail to correct the problems of claim 1 from which they depend.

Claims 1-16 are further rejected as being indefinite as the phrase "detecting an oscillation of the transducer" is confusing and indefinite. The "transducer" does not oscillate. It is the "surface" which oscillates. Therefore, how, and why, does the analyzer detect the oscillation of the transducer? Further confusion arises from the use of the phrase "one of these causing the transducer to oscillate the surface and the other being supplied as an output to the analyser".

How does the transducer differentiate which frequency goes to which device? Are there filters between the transducer and the surface and between the transducer and the analyzer such that only those desired frequencies are sent to the appropriate device? If so, this is not supported by the specification as originally filed or by the drawings now present in the application. Again, claims 2-16 are rejected as they fail to correct the problems of claim 1 from which they depend.

Claim 6 is further rejected as being indefinite as the phrase "the transducer's resonant frequencies" lacks a proper antecedent basis in claim 1 from which claim 6 depends. The first occurrence of the transducer's resonant frequency is found in claim 3, not claim 1. A suggestion for correction is to change the dependency of claim 6 from claim 1 to claim 3.

Claim 7 is further rejected as being confusing as it is unclear which of the recited list is the "immobilised analyte" and which is the "binding partner" being claimed. Can each of the items listed within the claim be either an "analyte" or a "binding partner"? A suggestion for correction is to split the "analytes" from the "binding partner" and list them in separate claims so that one of ordinary skill in the art can tell the difference between an "analyte" and a "binding partner".

Claims 17-24 are rejected as being indefinite as the phrase "separating an analyte from a mixture or for detecting an analyte or for determining the affinity, or a property related to affinity, between binding partners", found in the preamble of claim 17, renders the claims indefinite as it makes the scope of the claim undeterminable due to the excessive number of operations which can be, or are being, performed by the claimed invention. Claims 18-24 are rejected as they fail to correct the problems of claim 17 from which they depend.

Claims 17-24 are further rejected as being indefinite as the phrase "one of these causing the surface to oscillate and the other being supplied as an output to the analyzer". How does the surface differentiate between the frequencies such that only one is used to oscillate the surface? Again claims 18-24 are rejected as they fail to correct the problems of claim 17 from which they depend.

Claim 21 is further rejected as being indefinite as the phrases "one of the transducer's overtone frequencies" and "the transducer's fundamental frequency" lack a proper antecedent basis. Claims 17 and 20, from which claim 21 depend, fail to recite a "transducer". Therefore, there is no antecedent basis for the above recited phrases. The first occurrence of the transducer is in claim 18.

Claim 22 is further rejected as being indefinite as the phrases "the transducer" and the "at least one of the transducer's resonant frequencies" lack a proper antecedent basis in claim 17 from which claim 22 depends. The first occurrence of the transducer is in claim 18.

The claims are generally narrative and indefinite, failing to conform with current U.S. practice. They appear to be a literal translation into English from a foreign document and as such make it difficult to determine that which is actually being claimed or the scope of the claimed invention. It is suggested that the claims be rewritten to conform to current U.S. practice. Such rewriting should eliminate most if not all of the problems recited above.

***Claim Rejections - 35 USC § 103***

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

9. Claims 1-14 and 16-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Klenerman et al. (WO 01/02857 A1)** in view of **Vig (US 5,042,288)** and **Schodowski (US 4,872,765)**.

With regards to claim 1, **Klenerman et al.** discloses an apparatus for separating an analyte from a mixture or for detecting an analyte or for determining the affinity, or a property related to affinity, between binding partners comprising: a) a surface (10) having the analyte or one of the binding partners (16) immobilised thereon; b) a transducer (10) for oscillating the surface; c) a controller (14, 15) connected to the transducer for varying the amplitude and/or frequency of the oscillation to cause a dissociation event; and d) an analyser (15) connected to

the transducer for detecting an oscillation of the transducer due to the dissociation event (see abstract). Including the controller having an oscillator (11) connected in a resonant circuit (see Figure 1) with the transducer (10). **Klenerman et al.** also discloses the transducer producing two frequencies, one of the frequencies causing the transducer to oscillate (through oscillator 11) and the other being supplied as an output to the analyzer (see Figure 1, filter 13 filters out second frequency to send to the analyzer).

**Klenerman et al.** discloses the claimed invention with the exception of the transducer oscillating at two frequencies simultaneously, one of these causing the transducer to oscillate the surface and the other being supplied as an output to the analyser.

**Vig** teaches that it is known to utilize a dual mode resonator oscillated at two different frequencies to measure the presence/absence of an analyte. **Schodowski** is incorporated into **Vig** to show the exact dual mode resonator being used in the system of **Vig**.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to supply the system of **Klenerman et al.** with two separate frequencies for oscillating the surface of the sensor as **Vig** teaches that the dual mode operation of a resonator at two frequencies allows the operator to perform the desired analyte measuring while compensating for temperature variations within the system.

With regards to 2, **Klenerman et al.** discloses the frequency that is supplied as an output to the analyser is a multiple of the frequency that causes the surface to oscillate (see page 7 lines 10-34).

With regards to claim 3, **Klenerman et al.** discloses the frequency that causes the surface to oscillate is the transducer's fundamental resonant frequency and the frequency supplied as an output to the analyser is one of the transducer's overtone frequencies (see page 7 lines 10-34).

With regards to claims 4 and 5, **Klenerman et al.** fails to disclose the frequency that causes the surface to oscillate is a multiple of the frequency that is supplied as an output to the analyser and that the frequency that causes the surface to oscillate is one of the transducer's overtone frequencies and the frequency supplied as an output to the analyser is the transducer's fundamental frequency. It would have been obvious to one of ordinary skill in the art to operate the system of **Klenerman et al.** in the manner claimed as the disclosed system would operate in the same manner with either the resonant frequency or the overtone frequency utilized to drive the surface oscillation. The relationship between the surface oscillation

frequency and the analyzer frequency remains the same – one is the harmonic or overtone of the other with enough distance (frequency distance that is) between the two that they do not interfere with one another or cause residual signals that can bleed into the other measured frequency. It is this relationship and distance which allows the system to perform the desired functions and therefore, as long as this relationship is maintained, the system will operate as desired no matter which frequency is utilized to drive the surface oscillation.

With regards to claim 6, **Klenerman et al.** discloses the oscillation of the transducer due to the dissociation event being at a range of frequencies located around at least one of the transducer's resonant frequencies (see page 7 lines 10-34).

With regards to claim 7, **Klenerman et al.** discloses the immobilised analyte or binding partner being a metal, a polymer, a dendrimer, a self- assembled monolayer, a peptide, a protein, an antibody, an antigen, an enzyme, an enzyme inhibitor, a biologically active molecule, a drug, a polynucleotide or a peptide polynucleotide (see page 5 lines 3-11 and page 5 line 28 – page 6 line 2).

With regards to claim 8, **Klenerman et al.** discloses the immobilised analyte or binding partner being a cell, a bacterium, a virus, a prion, an amyloid, a proteinaceous aggregate or a phage (see page 5 lines 3-11 and page 5 line 28 – page 6 line 2).

With regards to claim 9, **Klenerman et al.** discloses the different analytes or binding partners being immobilised at different positions on the surface (see page 5 line 28 – page 6 line 2).

With regards to claim 10, **Klenerman et al.** discloses the dissociation event being detected as a motional oscillation (see page 5 lines 12-23).

With regards to claim 11, **Klenerman et al.** discloses the transducer being a piezoelectric transducer (see page 5 lines 20-23).

With regards to claim 12, **Klenerman et al.** discloses the transducer being a quartz crystal microbalance or surface acoustic wave device (see page 5 lines 20-23, page 7 lines 10-34, and Figures 8-9).

With regards to claim 13, **Klenerman et al.** discloses the claimed invention with the exception of the transducer specifically comprising zinc oxide, a piezoelectric polymer or a piezo-ceramic. It is known throughout the art of resonators that zinc oxide, piezoelectric materials, and piezoceramic materials all make excellent transducers and excellent resonators. Therefore, it would have been well within the purview of one of ordinary skill in the art to select

zinc oxide, a piezoelectric polymer or a piezo-ceramic for the transducer material of the **Klenerman et al.**

With regards to claim 14, **Klenerman et al.** fails to disclose the oscillator being a dual frequency crystal oscillator. **Vig** teaches that it is known to utilize a dual mode resonator oscillated at two different frequencies to measure the presence/absence of an analyte and specifically discloses utilizing dual mode resonator of **Schodowski** as the resonator utilized within the analyte sensing system. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to supply the system of **Klenerman et al.** with a dual frequency crystal oscillator as **Vig** teaches that the use of such a crystal oscillator allows the operator to perform the desired analyte measuring while compensating for temperature variations within the system.

With regards to claim 16, **Klenerman et al.** discloses the analyser comprising a radiofrequency radio-frequency detector and a digitizer (see Figure 9 and page 8 liens 8-16).

With regards to claim 17, **Klenerman et al.** discloses a method for separating an analyte from a mixture or for detecting an analyte or for determining the affinity, or a property related to affinity, between binding partners, the method comprising: a) immobilising the analyte or one of the binding partners on a surface (see Figure 1); b) oscillating the surface (see page 7 lines 10-34); c) varying the amplitude and/or frequency of the oscillation to cause a dissociation event (see page 7 lines 10-34 and abstract); and, d) detecting an oscillation due to the dissociation event using an analyser (see Figure 1 and page 7 lines 10-34). **Klenerman et al.** teaches using one frequency to cause the surface to oscillate and a second frequency being supplied as an output to the analyzer for use in detecting the oscillation due to the dissociation event (see Figure 1 and page 7 lines 10-34).

**Klenerman et al.** discloses the claimed invention with the exception of oscillating the surface at the two frequencies simultaneously.

**Vig** teaches that it is known to utilize a dual mode resonator oscillated at two different frequencies to measure the presence/absence of an analyte and specifically utilizes the dual mode resonator of **Schodowski** as the crystal oscillator being used.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to supply the system of **Klenerman et al.** with two separate frequencies for oscillating the surface of the sensor as **Vig** teaches that the dual mode operation of a resonator

at two frequencies allows the operator to perform the desired analyte measuring while compensating for temperature variations within the system.

With regards to claim 18, **Klenerman et al.** discloses the surface being oscillated using a transducer and the frequency that is supplied as an output to the analyser is a multiple of the frequency that causes the surface to oscillate (see Figure 1 and page 7 lines 10-34).

With regards to claim 19, **Klenerman et al.** discloses the frequency that causes the surface to oscillate is the transducer's fundamental resonant frequency and the frequency supplied as an output to the analyser is one of the transducer's overtone frequencies (see Figure 1 and page 7 lines 10-34).

With regards to claims 20-21, **Klenerman et al.** discloses the claimed invention with the exception of the frequency that causes the surface to oscillate is a multiple of the frequency that is supplied as an output to the analyser and the frequency that causes the surface to oscillate is one of the transducer's overtone frequencies and the frequency supplied as an output to the analyser is the transducer's fundamental frequency. It would have been obvious to one of ordinary skill in the art to operate the system of **Klenerman et al.** in the manner claimed as the disclosed system would operate in the same manner with either the resonant frequency or the overtone frequency utilized to drive the surface oscillation. The relationship between the surface oscillation frequency and the analyzer frequency remains the same – one is the harmonic or overtone of the other with enough distance (frequency distance that is) between the two that they do not interfere with one another or cause residual signals that can bleed into the other measured frequency. It is this relationship and distance which allows the system to perform the desired functions and therefore, as long as this relationship is maintained, the system will operate as desired no matter which frequency is utilized to drive the surface oscillation.

With regards to claim 22, **Klenerman et al.** discloses the oscillation of the transducer due to the dissociation event being at a range of frequencies located around at least one of the transducer's resonant frequencies (see page 7 lines 10-34).

With regards to claim 23, **Klenerman et al.** discloses immobilising different analyses or binding partners at different positions on the surface (see page 5 lines 28 - page 6 line 2).

With regards to claim 24, **Klenerman et al.** discloses detecting the dissociation event as a motional oscillation (see page 5 lines 12-24).

***Allowable Subject Matter***

10. Claim 15 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

***Conclusion***

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

**Gilden et al. (US 4,085,388)** discloses a mode-locked surface acoustic wave oscillator.

**Newell et al. (US 4,760,351)** discloses a multiple oscillator device having plural quartz resonators in a common quartz substrate.

**Vig (US 5,744,902)** discloses a chemical and biological sensor based on microresonators.

**Klenerman et al. (US 6,589,727 B1)** discloses the measurement and use of molecular interactions with a rupture event sensor.

**Klenerman et al. (US 2003/0194697 A1)** discloses the measurement and use of molecular interactions with a rupture event sensor.

**Klenerman et al. (US 7,195,909 B2)** discloses the measurement and use of molecular interactions with a rupture event sensor.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to ROSE M. MILLER whose telephone number is (571)272-2199. The examiner can normally be reached on Monday - Friday, 8:00 am to 4:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hezron Williams can be reached on 571-272-2208. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/RMM/
21 June 2008
/Hezron Williams/
Supervisory Patent Examiner, Art Unit 2856